

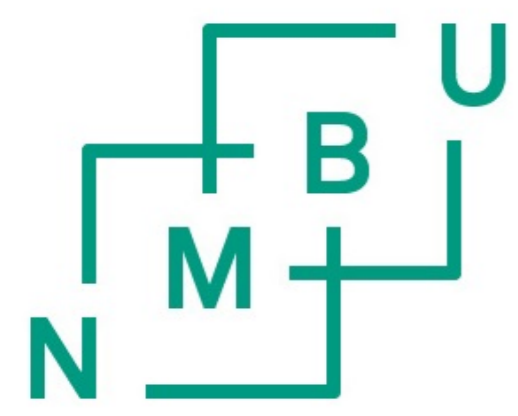
# Factors associated with farmers' use of minimum tillage in Zambia: A double hurdle modeling approach

Hambulo Ngoma<sup>a</sup>, Brian P. Mulenga<sup>b</sup> and Thomas S. Jayne<sup>c</sup>

*a. Norwegian University of Life Sciences; b. Indaba Agricultural Policy Research Institute; c.*

*Michigan State University*

hambulo.ngoma@nmbu.no



## Introduction

Minimum tillage (MT) is part of the core conservation agriculture (CA) practices. CA offers potential to raise yields and help farmers adapt to climate variability. Despite almost 20 years of actively promoting minimum tillage (MT) among smallholder farmers, the extent of its adoption remains mixed in sub-Saharan Africa [1,2]. Adoption estimates over 2008-2012 ranged from 2%-70% in Zambia. *Why would they be so different?* Three issues emerge; i) adoption is often ill-defined, ii) none-use of appropriate sampling weights, and iii) focus on small samples from project sites.

We use nationally representative crop forecast survey data from ca. 88,000 smallholders for 2008-2014 to assess MT (ripping and/or basin tillage) *use rates* as main tillage for any field crop.

## Main Research Question

*What drives farmers' decision to use MT (extensive margin) and use intensity (intensive margin)?*

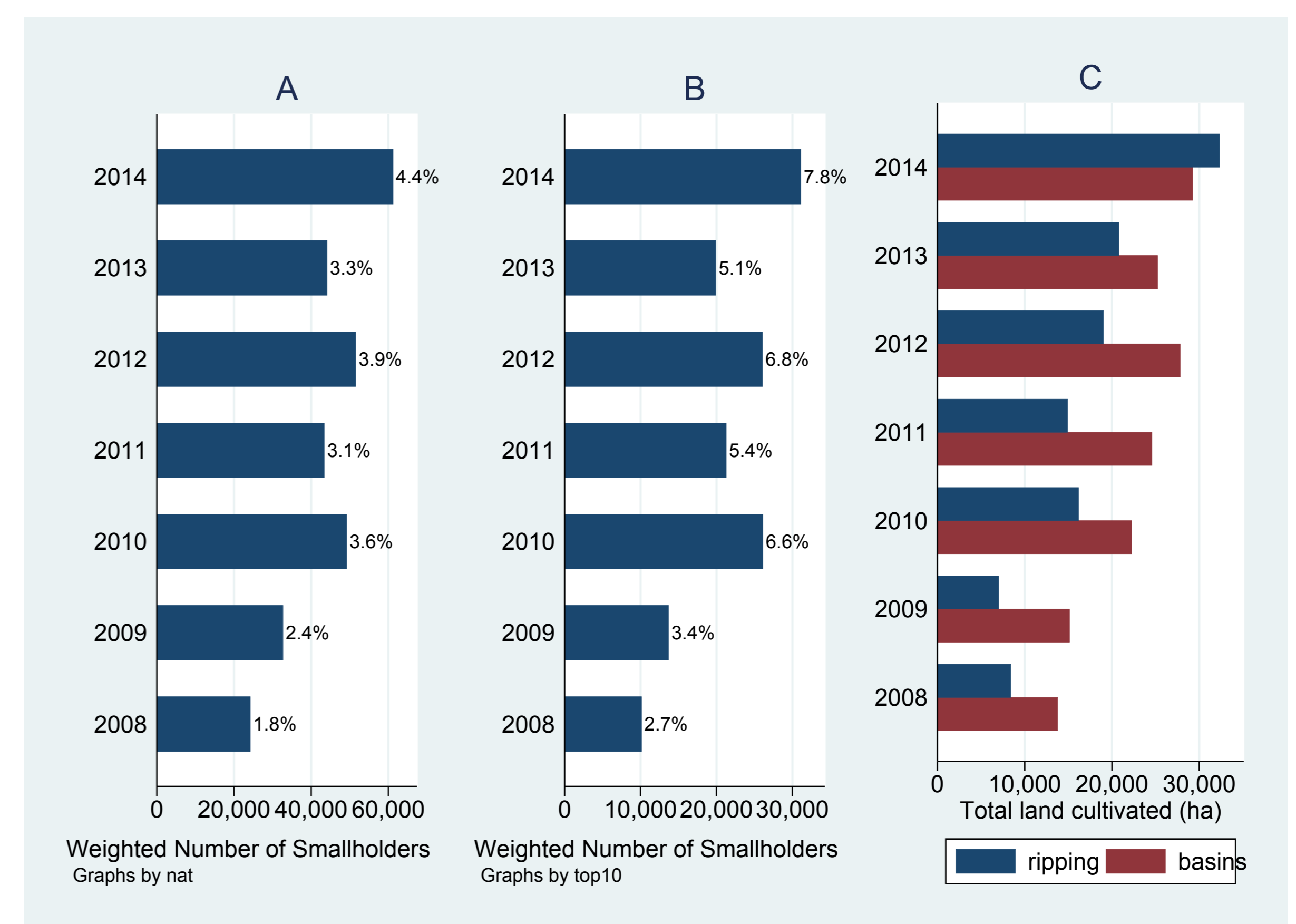
## Methods

We applied an endogenous double hurdle model to determine factors influencing MT use and to control for the potential endogeneity of being in MT promotion areas on MT use.

## Main Results

### Descriptive results

- MT use trends and intensity of use; 2008-2014.



**Figure 1: Trends in, and proportions of minimum tillage use by smallholders at national level (panel A) and in the top 10 highest use districts (panel B) and land under ripping and basins (panel C).**

Note: Percentages in panels A and B show proportions of MT users

- Less than 5% MT use & <10% in highest use
- More land under ripping than basins in 2014

## Empirical results

- Selected average partial effects (APEs)

**Table 1: Drivers of minimum tillage use and use-intensity by smallholders**

Variables	APE1p	APE1o	APE2p	APE2o
MTarea (0/1)	-0.065**	-0.134***	0.005***	0.009*
MTresidual	0.035**	0.075***	-	-
SPI	-0.003**	-0.004***	-0.005***	-0.009***
Rain stress	0.004***	0.008***	0.002*	0.001

Notes: APE1p and APE1o are probability & overall APEs for basin tillage use, APE2p & APE2o are for ripping. \*\*\*, \*\*, \* denote significance at 1%, 5% and 10%. SPI is the standard precipitation index

- Lower rainfall increases MT use

## Conclusions

- Rising MT use as main tillage in Zambia; less than 5% up-to 2014, higher use (<10%) in promotion areas.
- Lower rainfall increases MT use & MT promotion increases ripping tillage use but not basins.

## References

- [1] Giller et al., 2009. Conservation agriculture and smallholder farming in Africa: The heretics view. *Field Crops Research* 114, 23-34.
- [2] Andersson et al., 2014. From adoption claims to understanding farmers and contexts: A literature review of CA adoption among smallholder farmers in southern Africa. *Agric., Ecosys & Env* 187, 116-132.

## Acknowledgements

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